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# Robust and Efficient Self-Adaptive Position Tracking in Wireless Embedded Systems

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## Abstract

© 2015 IEEE.Apart from static deployments, sensor nodes in Wireless Sensor Networks (WSNs) are unaware of their location information. In order to estimate their actual or relative positions with respect to other nodes, they are required to self-localize themselves by collecting information from their environment. However, due to the high dynamism and the noise introduced by the WSN environment, self-localization procedures are not straightforward and they may require quite sophisticated algorithmic techniques to satisfy precision requirements of the WSN applications. Among the self-localization procedures in the literature, the ones based upon the technique of trilateration are easy to implement and efficient in terms of resource requirements. On the other hand, their performance is fragile against environmental dynamics. Besides, even though multilateration based procedures are reported to be more robust, their practicability in WSNs seems questionable due to their high resource requirements. In this paper, our objective is to develop a practical self-localization procedure for WSNs that puts away the fragility against noisy ranging measurements in an efficient manner. To that end, we take a different approach to self-localization procedure and treat it as a search process during which sensor nodes find their relative positions without knowing the actual correct values. We present a novel trilateration-based self-localization procedure by exploiting a robust and efficient search technique, named Adaptive Value Tracking (AVT), that finds and tracks a dynamic searched value in a given search space through successive feedbacks. We evaluate this procedure on a real test bed setup and show that our approach to self-localization is efficient, robust to environmental dynamics and adaptive in the sense of reacting to position changes.

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## Keywords

Adaptive Value Tracking, Distributed Algorithms, Self-Localization, Wireless Sensor Networks